US010148022B2

(12) **United States Patent**
Huang et al.

(10) **Patent No.: US 10,148,022 B2**
(45) **Date of Patent: Dec. 4, 2018**

(54) **CABLE CONNECTOR ASSEMBLY**

(71) Applicant: **FOXCONN INTERCONNECT TECHNOLOGY LIMITED**, Grand Cayman (KY)

(72) Inventors: **Shuai-Hui Huang**, Kunshan (CN); **Ru-Yang Guo**, Kunshan (CN); **Qing-Man Zhu**, Kunshan (CN); **Jerry Wu**, New Taipei, CA (US)

(73) Assignee: **FOXCONN INTERCONNECT TECHNOLOGY LIMITED**, Grand Cayman (KY)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/851,594**

(22) Filed: **Dec. 21, 2017**

(65) **Prior Publication Data**

US 2018/0175523 A1 Jun. 21, 2018

(30) **Foreign Application Priority Data**

Dec. 21, 2016 (CN) ..... 2016 2 1406298 U

(51) **Int. Cl.**
H01R 13/66 (2006.01)
H01R 12/53 (2011.01)
H01R 12/71 (2011.01)

(52) **U.S. Cl.**
CPC ***H01R 12/53*** (2013.01); ***H01R 12/716*** (2013.01); ***H01R 13/6691*** (2013.01)

(58) **Field of Classification Search**
CPC ... H01R 13/6691; H01R 12/53; H01R 12/716
USPC 439/620.15, 490
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,034,846	A *	7/1991	Hodge	H01R 13/6666 361/119
6,752,649	B2 *	6/2004	Arkin	H01R 31/065 439/491
7,429,188	B2 *	9/2008	Wu	H01R 13/7172 439/490
7,540,773	B2 *	6/2009	Ko	H01R 13/5808 439/581
7,628,619	B2 *	12/2009	Chuang	H01R 13/6658 439/620.08
7,722,363	B2 *	5/2010	Zhou	H01R 12/515 439/490
7,744,231	B2 *	6/2010	Hutchinson	G02B 6/0001 362/555

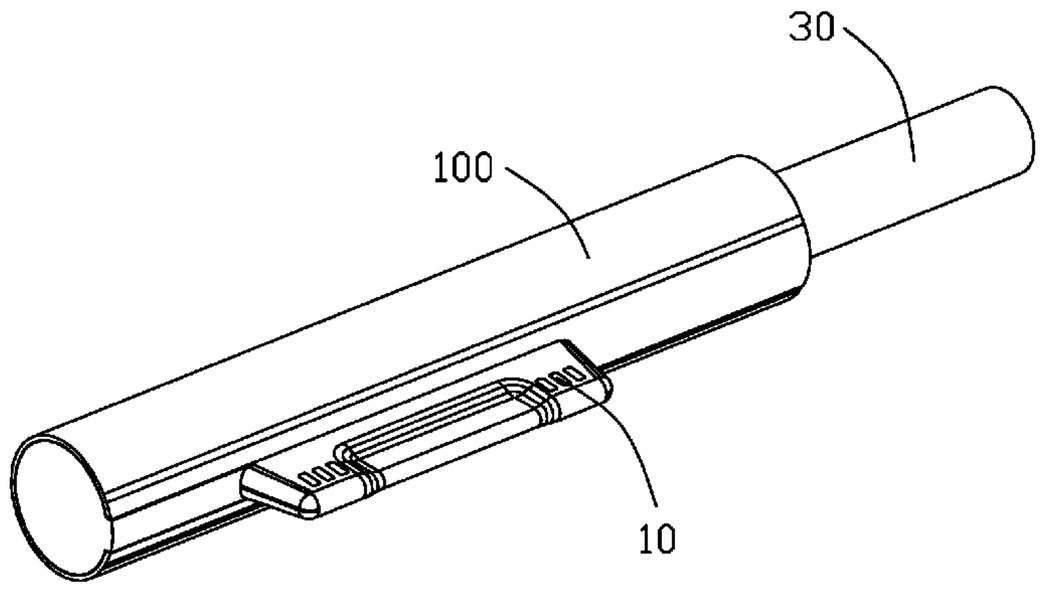
(Continued)

Primary Examiner — Abdullah Riyami
Assistant Examiner — Vladimir Imas
(74) *Attorney, Agent, or Firm* — Wei Te Chung; Ming Chieh Chang

(57) **ABSTRACT**

A cable connector assembly includes: a plug connector including plural conductive terminals; a cable including plural core wires, a braided layer coated the core wires, a cap coated the braided layer, and a metal member; a printed circuit board (PCB) including a first surface and a second surface opposite to the first surface, the plug connector being mounted on the first surface of the PCB; wherein the first surface of the PCB has three grounding holes at one end of the PCB, the second surface has plural conductive pads, the metal member includes a ring clamping the braided layer and a grounding portion extending from the ring, the grounding portion includes three grounding fingers inserted into the three grounding holes, respectively.

20 Claims, 8 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

7,753,689	B1 *	7/2010	Wu	H01R 13/648 439/490
7,914,320	B2 *	3/2011	Ko	H01R 13/7175 439/490
8,011,935	B2 *	9/2011	Ko	H01R 13/5845 439/490
8,535,088	B2 *	9/2013	Gao	H01R 9/03 439/490
8,641,445	B2 *	2/2014	Su	H01R 13/7175 439/490
9,017,092	B1 *	4/2015	McCracken	H01R 13/62 439/374
9,065,205	B2 *	6/2015	Gao	H01R 13/5808
9,480,169	B2 *	10/2016	Huang	H01R 13/504
9,705,263	B2 *	7/2017	Huang	H01R 13/7175
9,780,503	B2 *	10/2017	Huang	H01R 13/5213
2006/0246783	A1 *	11/2006	Ho	H01R 13/508 439/669
2015/0214677	A1 *	7/2015	Huang	H01R 13/7175 439/39
2016/0240984	A1 *	8/2016	Huang	H01R 13/7175

* cited by examiner

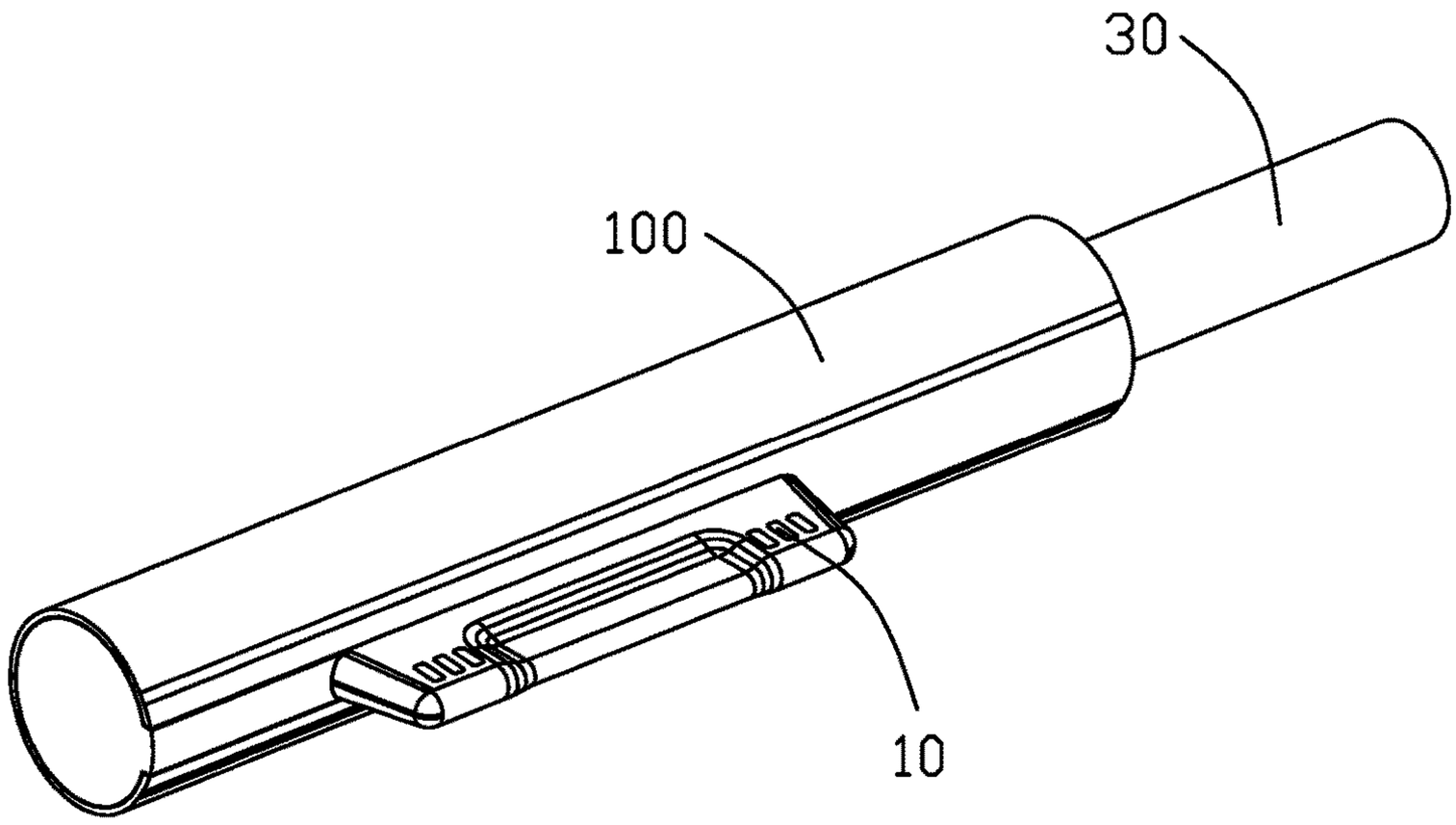


FIG. 1

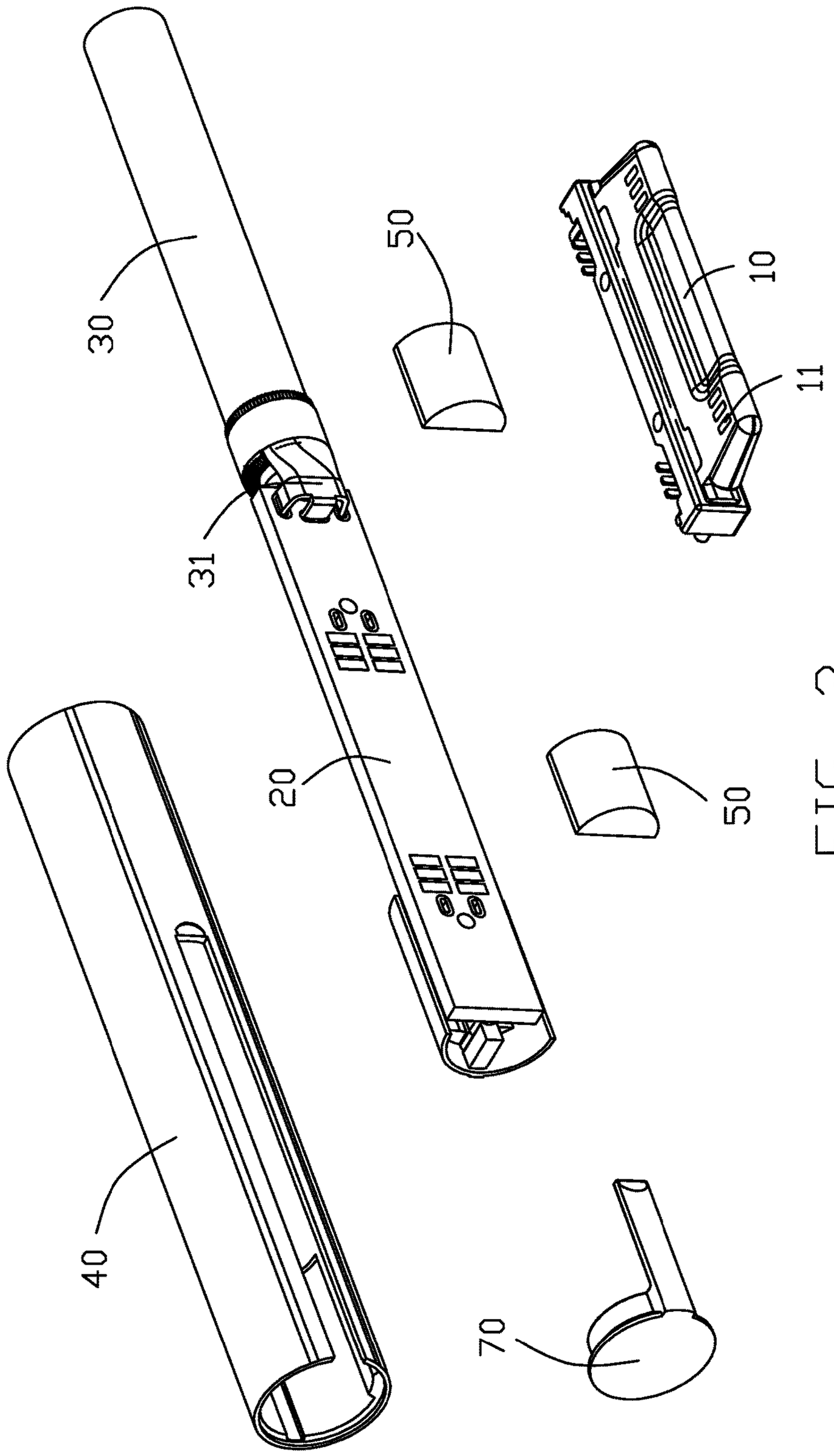


FIG. 2

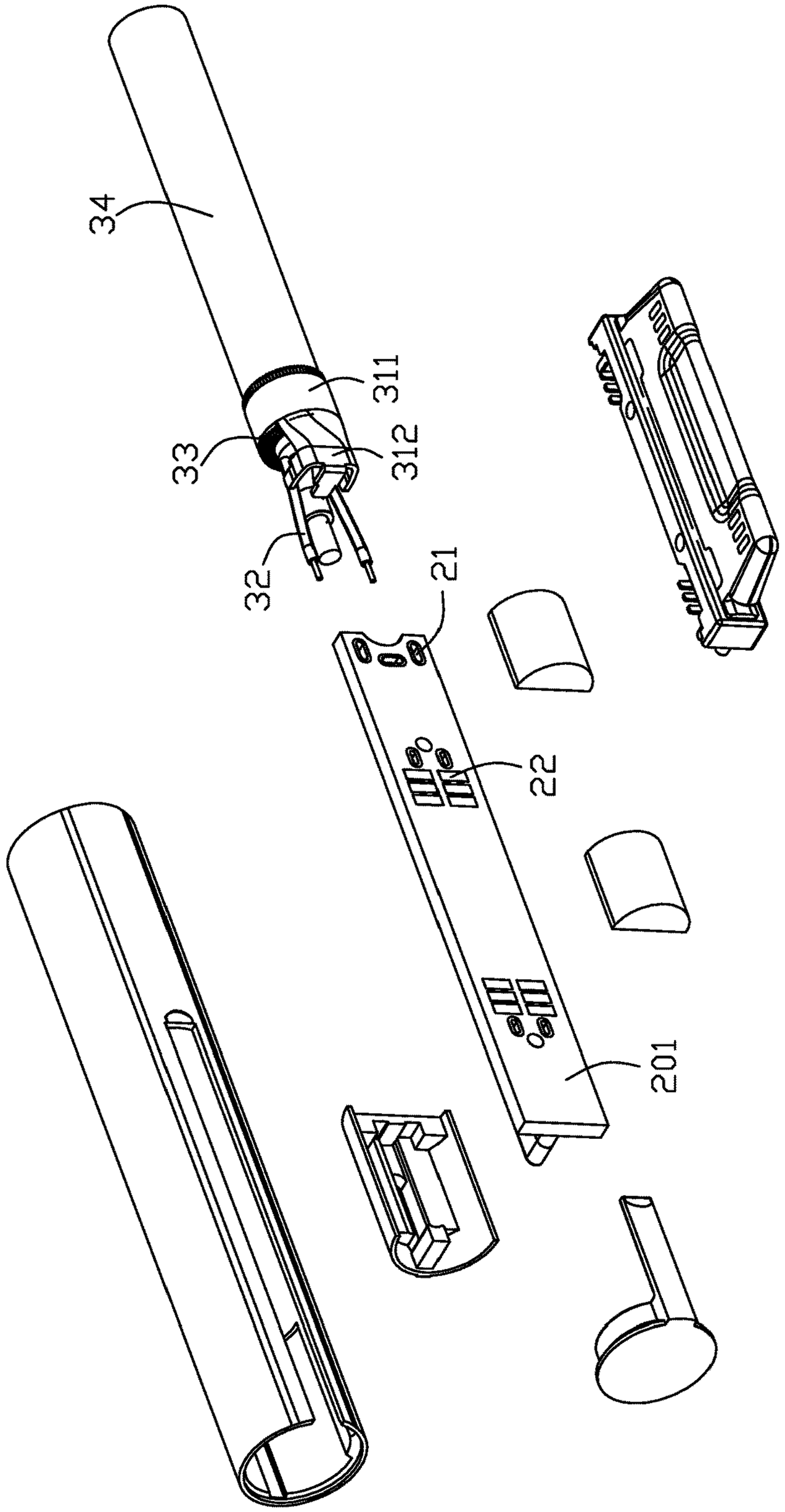


FIG. 3

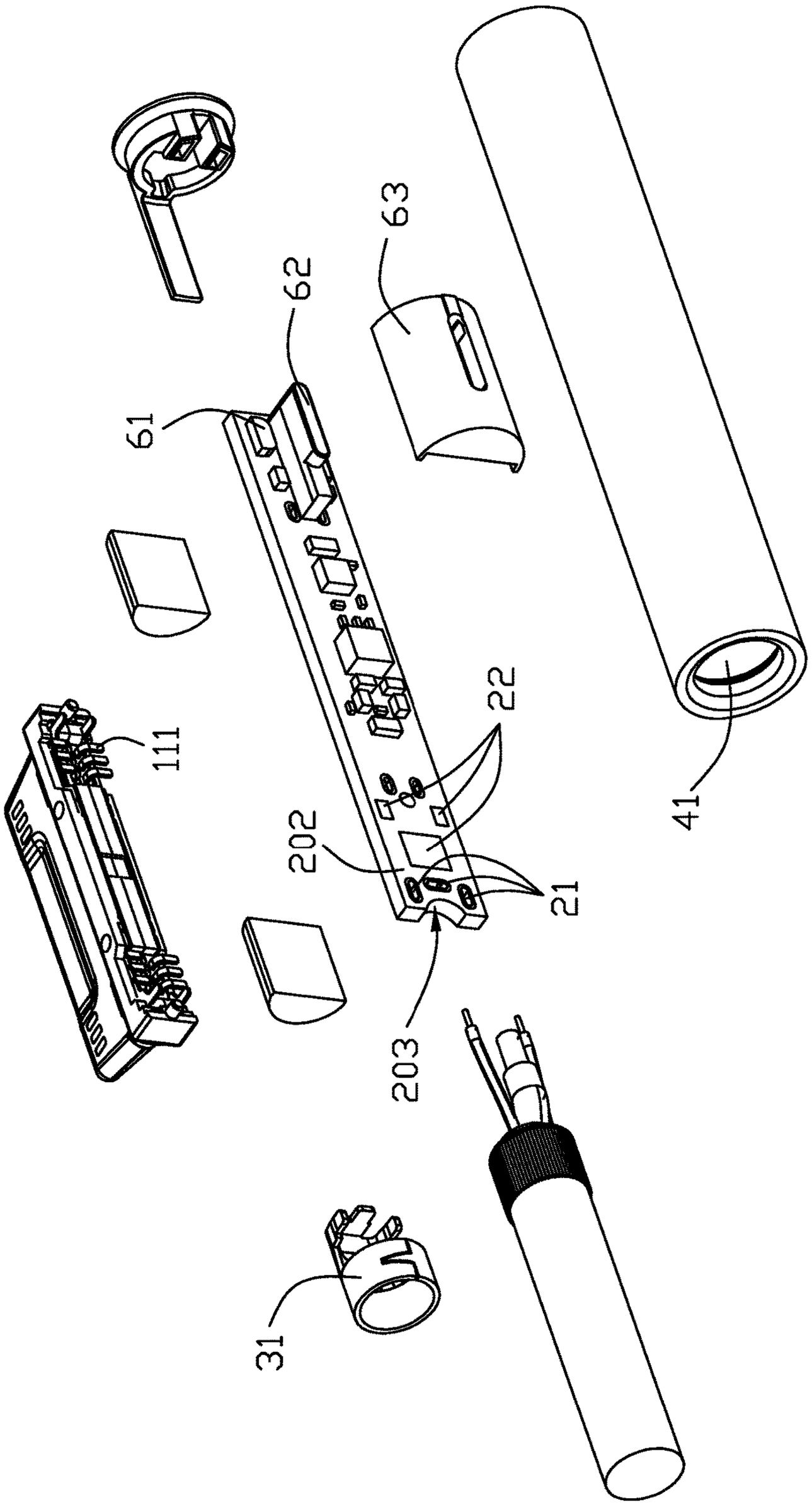


FIG. 4

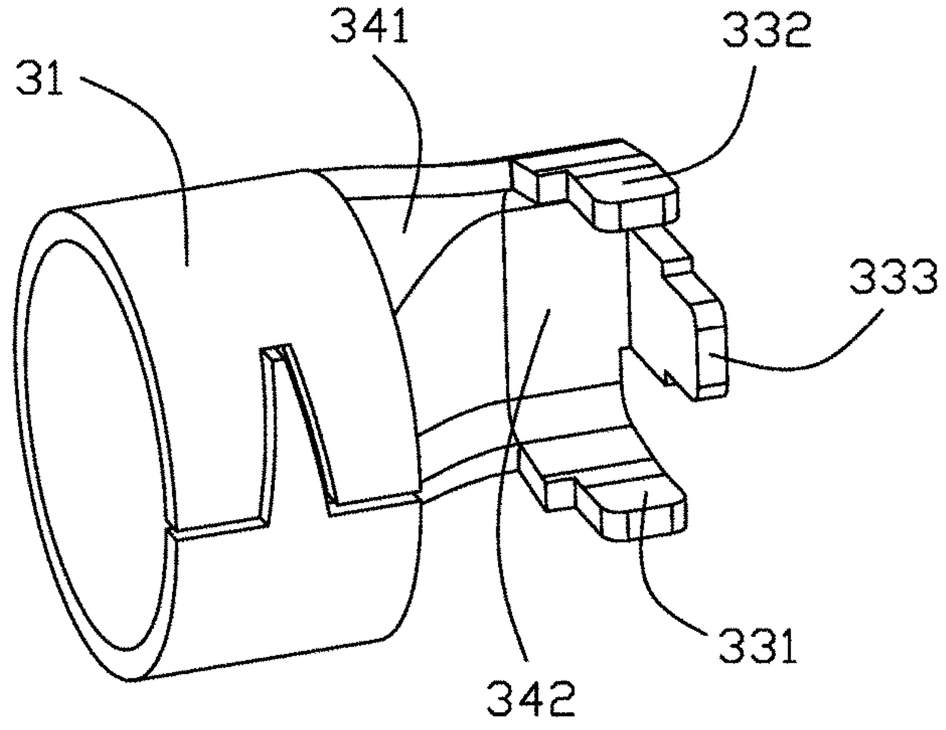


FIG. 5

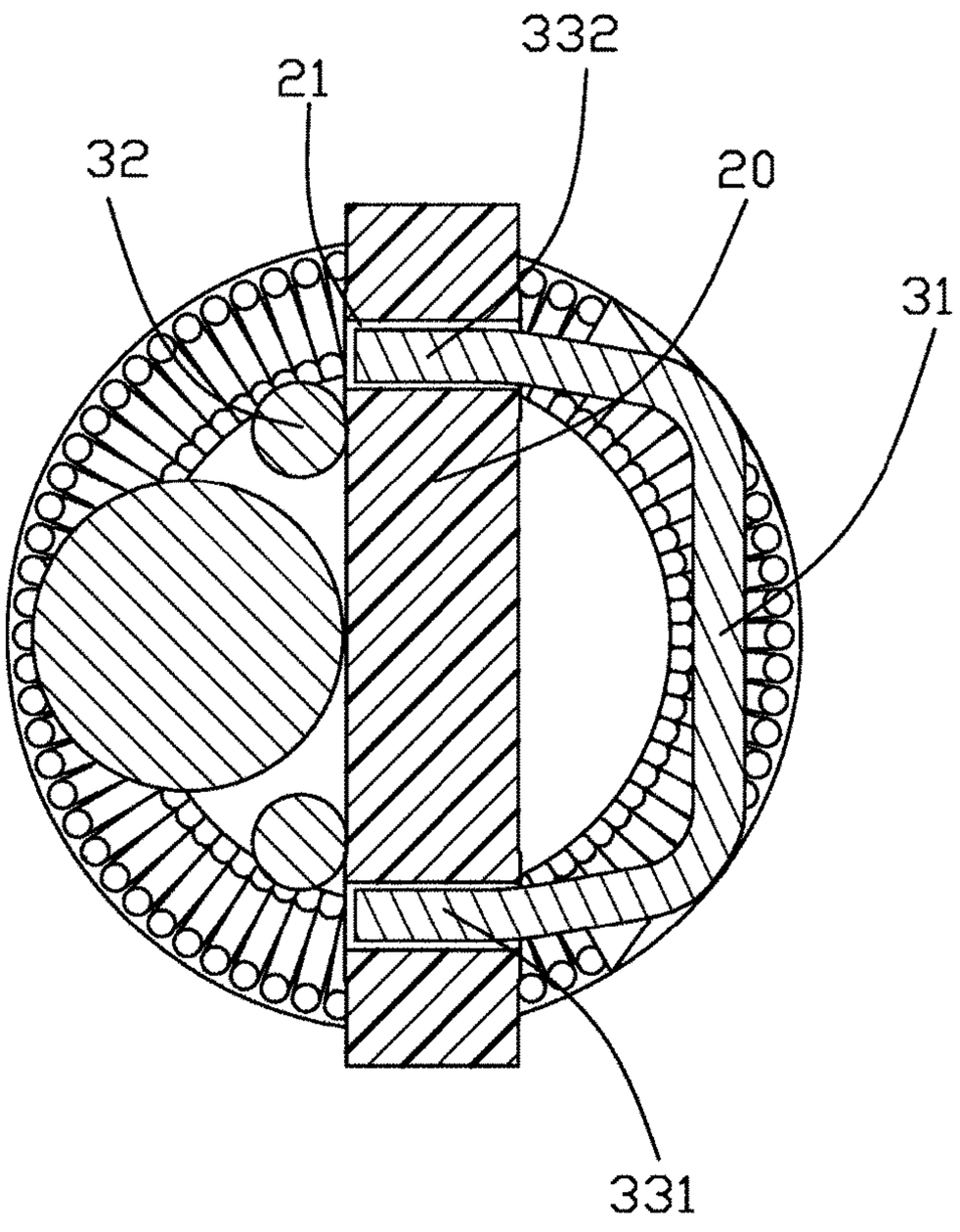


FIG. 6

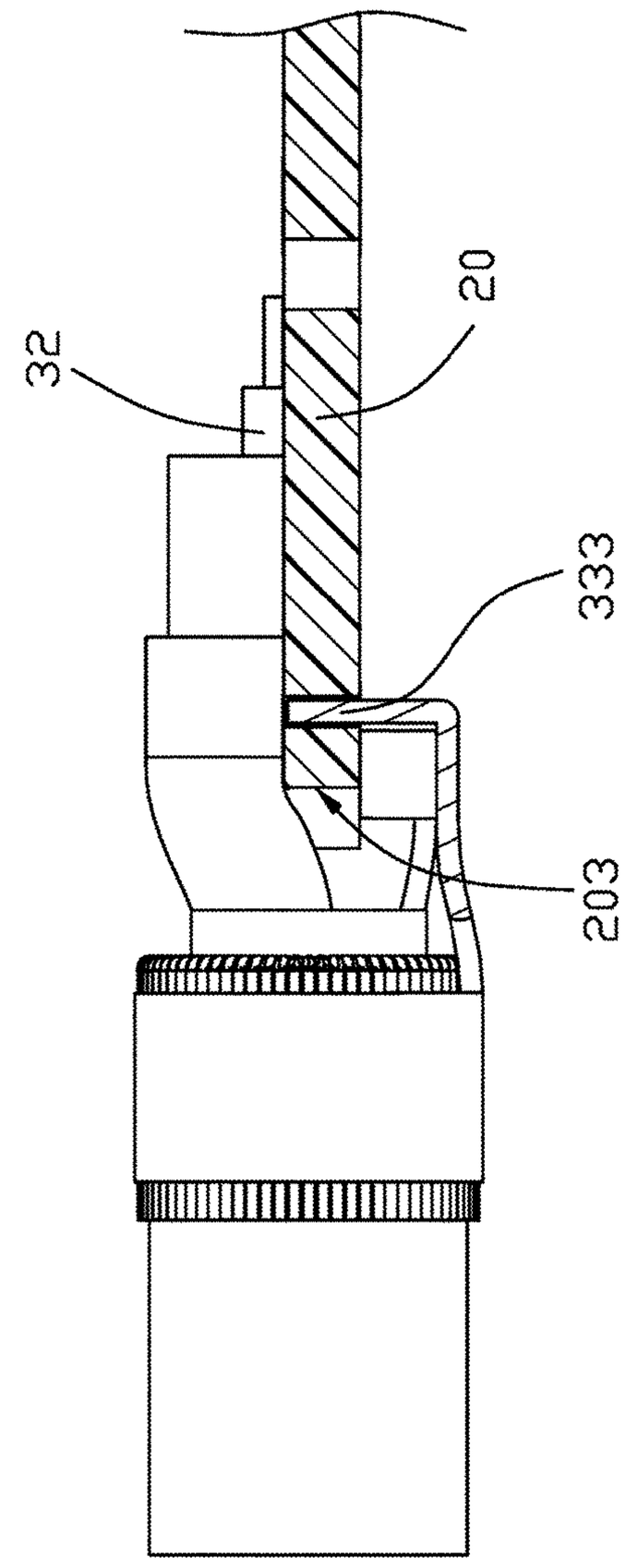


FIG. 7

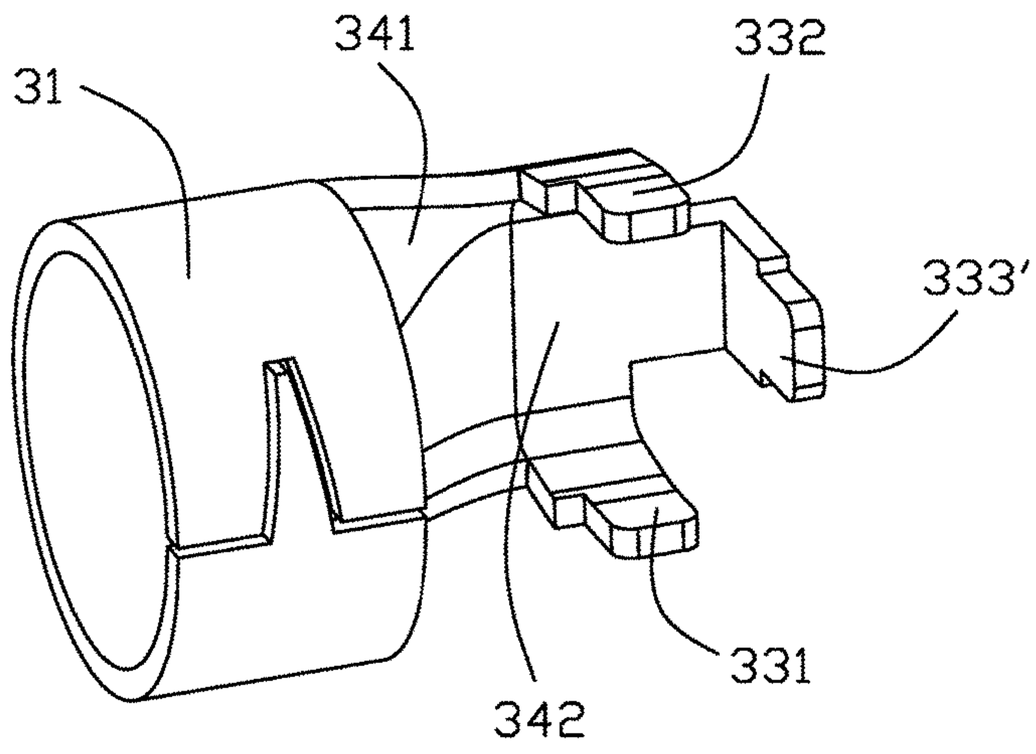


FIG. 8

CABLE CONNECTOR ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present disclosure relates to a cable connector assembly.

2. Description of Related Arts

U.S. Pat. No. 9,705,263 discloses a plug connector assembly including a printed circuit board (PCB) and a cable welded on the PCB. The covering layer of the cable is connected with a metal member. The metal member includes only two soldering tails welded on the PCB.

An improved cable connector assembly is desired.

SUMMARY OF THE INVENTION

Accordingly, an object of the present invention is to provide a cable connector assembly capable of strengthening the holding capacity of the cable.

To achieve the above object, a cable connector assembly comprises: a plug connector including plural conductive terminals; a cable including plural core wires, a braided layer coated the core wires, a cap coated the braided layer, and a metal member; a printed circuit board (PCB) including a first surface and a second surface opposite to the first surface, the plug connector being mounted on the first surface of the PCB; wherein the first surface of the PCB has three grounding holes at one end of the PCB, the second surface has plural conductive pads, the metal member includes a ring clamping the braided layer and a grounding portion extending from the ring, the grounding portion includes three grounding fingers inserted into the three grounding holes, respectively.

Other objects, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a cable connector assembly;

FIG. **2** is an partial exploded view of cable connector assembly as show in FIG. **2**;

FIG. **3** is a further exploded view of cable connector assembly as shown in FIG. **2**;

FIG. **4** is another further exploded view of plug connector as shown in FIG. **2**;

FIG. **5** a perspective view of a metal member;

FIG. **6** is a cross-sectional view of the cable connector assembly of FIG. **1**;

FIG. **7** is a side view of the cable connector assembly of FIG. **1** without the shell and a part is partially cross-sectioned to show the large core wire extends through the notch; and

FIG. **8** is a perspective view of a metal member according to another embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference will now be made in detail to the preferred embodiment of the present invention.

Referring to FIGS. **1** to **8**, a cable connector assembly **100** includes a plug connector **10**, a printed circuit board **20**, and a cable **30**. The plug connector **10** is fixed with conductive terminals **11**. The printed circuit board **20** includes a first surface **201** and a second surface **202** opposite to the first surface **201**. The plug connector **10** is mounted on the first surface **201**. The first surface **201** includes three grounding holes in the end side, the three grounding holes are arranged in a "door" type, and the second surface **202** includes conductive pads **22**. The cable **30** extending along an axial direction, includes core wires **32** including a center large one and two side small ones respectively welded on the conductive pads **22**, a braided layer **33** coated the core wires **32**, an insulative cap or insulator **34** coated the braided layer **33** and a crimping metal member **31**. The metal member **31** includes a ring **311** clamped the braided layer **33** and a grounding portion **312** extending from the ring **311**. The grounding portion **312** includes three grounding fingers **331**,**332**,**333** inserted into the three grounding holes **21** respectively. The grounding portion **312** also includes an elastic arm **341** extending from the ring **31** to the printed circuit board **20**, a connecting portion **342** extending from the front edge of elastic arm **341** in the transverse. Two ends of the connecting portion **342** vertically bent out of the first grounding finger **331** and second grounding finger **332**. The front edge of the connecting portion **342** vertically bent out of the third grounding fingers **333**. Third the grounding finger **333** is perpendicular to the first and second grounding finger **331**, **332**. The present invention relates to grounding portion **312** including three grounding fingers **331**,**332**,**333**, which makes the holding force between the print circuit boards more stable, and at the same time, it can also ensure the requirement of temperature rise when the cable connector assembly transmits high current.

A description of other components of the cable connector assembly **100** is as follows.

The cable connector assembly **100** also includes an insulative shell **40**. One end of the printed circuit board **20** and cable **30** is received in the insulative shell **40**. The plug **10** passes through the insulative shell **40** and is exposed to the outside. The printed circuit board **20** has pads **22**. The conductive terminals are welded on the pads **22** of the printed circuit board **20** by SMT process. One end of the insulative shell **40** has a through hole **41** for the cable **30** through. The size of the through hole **41** is less than printed circuit board **20**, but with the same size of cable **30**.

The plug **20** is in the shape of the tongue plate and vertically mounts on the printed circuit board **20**. The conductive terminals **11** are exposed to the opposite sides of the tongue plate and located at both ends of each side of the tongue plate while depressed in the middle of the tongue plate.

The first surface **201** of the printed circuit board **20** has two magnetic components **4** located at both ends of the plug **10**.

The second surface **201** of the printed circuit board **20** has a pair of LEDs **61**, a light guide member **62** transmitting the light of LEDs **61** and a shading/retaining member **63** covering the LEDs **61** and light guide member **62**. The light guide member **62** and shading/retaining member **63** locate in the insulative shell **40**. The insulative shell **40** has a front plug at the other end of the cable **30**.

The feature of the invention is to provide the grounding portion of the metal member with three grounding fingers extending through the corresponding three holes in the PCB with a triangular configuration thereof, i.e., being nonlinear, wherein the corresponding grounding holes **21** are located

behind the corresponding conductive pads **22** on which the corresponding core wires **32** are soldered. In this embodiment, the rear edge of the printed circuit board forms a notch **203** so as to allow a portion of the center large core wire **32** to pass. FIG. **8** shows another embodiment in which the middle grounding fingers **333'** further extends forward from the ring for better stability thereof.

While a preferred embodiment in accordance with the present invention has been shown and described, equivalent modifications and changes known to persons skilled in the art according to the spirit of the present invention are considered within the scope of the present invention as described in the appended claims.

What is claimed is:

1. A cable connector assembly comprising:

a plug connector including plural conductive terminals;

a cable including plural core wires, a braided layer coated the core wires, a cap coated the braided layer, and a metal member;

a printed circuit board (PCB) including a first surface and a second surface opposite to the first surface, the plug connector being mounted on the first surface of the PCB; wherein

the first surface of the PCB has three grounding holes at one end of the PCB, the second surface has plural conductive pads, the metal member includes a ring clamping the braided layer and a grounding portion extending from the ring, the grounding portion includes three grounding fingers inserted into the three grounding holes, respectively.

2. The cable connector assembly as claimed in claim **1**, wherein the grounding portion includes an elastic arm extending from the ring to the PCB and a connecting portion extending from the front edge of elastic arm, two ends of the connecting portion vertically bent out of a first grounding finger and a second grounding finger, a front edge of the connecting portion vertically bent out of a third grounding finger and perpendicular to the first and second grounding fingers.

3. The cable connector assembly as claimed in claim **1**, further including an insulative shell, wherein one end of the PCB and the cable is received in the insulative shell, and the plug connector passes through the insulative shell and is exposed to outside.

4. The cable connector assembly as claimed in claim **1**, wherein one end of the insulative shell has a through hole for the cable to extend through, and a size of the through hole is less than the PCB and is same as the cable.

5. The cable connector assembly as claimed in claim **3**, wherein the plug is in the shape of a tongue plate and vertically mounted on the PCB, the conductive terminals are exposed to two opposite sides of the tongue plate and located at both ends of each side of the tongue plate and depressed at a middle of the tongue plate.

6. The cable connector assembly as claimed in claim **5**, wherein the PCB has plural pads, and the conductive terminals are surface mounted to the pads.

7. The cable connector assembly as claimed in claim **6**, further comprising two magnetic components located on the first surface of the PCB at two ends of the plug.

8. The cable connector assembly as claimed in claim **5**, further comprising a pair of LEDs on the second surface of the PCB, a light guide member for transmitting the light of LEDs, and a shading member covering the LEDs and the light guide member, wherein the light guide member and shading member are located in the insulative shell.

9. A cable connector assembly comprising:

an elongated printed circuit board extending along an axial direction and defining thereon opposite first and second surfaces in a direction perpendicular to the axial direction;

a plug connector mounted upon the printed circuit board in said direction;

a cable connected to a rear end region of the printed circuit board and including a plurality of core wires and a braided layer surrounding the core wires; and

a metal member including a ring crimping the braided layer and a grounding portion unitarily extending forwardly from the ring; wherein

front end regions of the core wires are positioned upon the second surface and soldered to corresponding conductive pads on the second surface, the grounding portion is located upon the first surface and forms a plurality of grounding fingers extending, in said direction, into the grounding holes formed in the printed circuit board, while the ring is located behind a rear edge of the printed circuit board.

10. The cable connector assembly as claimed in claim **9**, wherein said conductive pads, on which the core wires are soldered, are located in front of the grounding holes in the axial direction.

11. The cable connector assembly as claimed in claim **10**, wherein an amount of the grounding fingers is at least three extending into three corresponding grounding holes, respectively, in said direction.

12. The cable connector assembly as claimed in claim **11**, wherein viewed in said direction, said three grounding holes are arranged with a triangular configuration.

13. The cable connector assembly as claimed in claim **12**, wherein said three grounding holes includes a middle one and two side ones, said middle one being located in front of the two side ones.

14. The cable connector assembly as claimed in claim **13**, wherein on the second surface, three are three conductive pads on which three core wires are soldered, and viewed along said direction, said three conductive pads is configured with another triangle which is opposite to said triangle in the axial direction.

15. The cable connector assembled in claim **14**, wherein the three core wires include a large one and two small one, and a rear edge of the printed circuit board defines a notch to allow the large one core wire to pass.

16. The cable connector assembly as claimed in claim **9**, wherein a mating direction of said plug connector is same with said direction.

17. A cable connector assembly comprising:

an elongated printed circuit board extending along an axial direction and defining thereon opposite first and second surfaces in a direction perpendicular to the axial direction;

a plug connector mounted upon the printed circuit board in said direction;

a cable connected to a rear end region of the printed circuit board and including a plurality of core wires and a braided layer surrounding the core wires; and

a metal member including a ring crimping the braided layer and a grounding portion unitarily extending forwardly from the ring; wherein

the grounding portion is located upon the first surface and forms at least three grounding fingers extending, in said direction, into the grounding holes formed in the printed circuit board, and the ring is located behind a rear edge of the printed circuit board; wherein

said three grounding fingers are arranged with a triangle viewed in said direction.

18. The cable connector assembly as claimed in claim **17**, wherein said three grounding holes includes a middle one and two side ones, said middle one being located in front of the two side ones.

19. The cable connector assembly as claimed in claim **18**, wherein on the second surface, three are three conductive pads on which three core wires are soldered, and viewed along said direction, said three conductive pads is configured with another triangle which is opposite to said triangle in the axial direction.

20. The cable connector assembled in claim **19**, wherein the three core wires include a large one and two small one, and a rear edge of the printed circuit board defines a notch to allow the large one core wire to pass.

* * * * *